

LISTING OF THE CLAIMS:

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Claims 1-7 (Cancelled).

8. (New) An OFDM-CDMA transmission apparatus comprising:  
a first spreader that carries out spreading processing on a plurality of transmission signals using different spreading codes respectively;

a second spreader that carries out spreading processing on at least one known signal using a spreading code different from said spreading codes;

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a frequency division multiplexer that breaks down the transmission signals after being spread at said first spreader and the known signal after being spread at said second spreader into individual chips and subjects said chips to frequency division multiplexing by assigning one chip data signal string per subcarrier; and

a transmitter that transmits the transmission signals and the known signal after being subjected to frequency division multiplexing at said frequency division multiplexer, wherein:

information from each of the plurality of transmission signals and the known signal is multiplexed into every chip assigned to a different subcarrier.

9. (New) The OFDM-CDMA transmission apparatus according to claim 8, wherein the known signal that is spreading processed by said second spreader has a higher signal level than said plurality of transmission signals.

10. (New) An OFDM-CDMA reception apparatus comprising:

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a receiver that receives a multiplexed signal comprising a plurality of subcarriers having a separate chip assigned to each subcarrier, each chip comprising information from a plurality of transmission signals and at least one known signal that are subjected to spreading processing using different spreading codes, respectively, and subjected to frequency division multiplexing;

a first demodulator that carries out, for each transmission signal, despreading processing on the multiplexed signal received by said receiver using a corresponding predetermined spreading code, to thereby extract a received version of the transmission signal;

a second demodulator that carries out despreading processing on the multiplexed signal received by said receiver using the spreading code assigned to the known signal, to thereby extract a received version of the known signal;

a phase error detector that detects a residual phase error using the known signal and the received version of the known signal; and

a phase compensator that carries out phase compensation on said received version of each transmission signal using the residual phase error.

11. (New) A communication terminal apparatus equipped with an OFDM-CDMA transmission apparatus and an OFDM-CDMA reception apparatus, said OFDM-CDMA transmission apparatus comprising:

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a first spreader that carries out spreading processing on a plurality of data signals using different spreading codes, respectively;

a second spreader that carries out spreading processing on at least one first known signal using a spreading code different from said spreading codes;

a frequency division multiplexer that breaks down the data signals spread at said first spreader and the first known signal spread at said second spreader into individual transmit chips and subjects said transmit chips to frequency division multiplexing by assigning one transmit chip data signal string per subcarrier such that information from each of the plurality of data signals

and the first known signal is multiplexed into every transmit chip assigned to a different subcarrier; and

a transmitter that transmits the data signals and the first known signal after being subjected to frequency division multiplexing at said frequency division multiplexer,

said OFDM-CDMA reception apparatus comprising:

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a receiver that receives a multiplexed signal comprising a plurality of subcarriers having a separate receive chip assigned to each subcarrier, each receive chip comprising information from a plurality of transmission signals and at least one second known signal that are subjected to spreading processing using different spreading codes, respectively, and subjected to frequency division multiplexing;

a first demodulator that carries out, for each transmission signal, despreading processing on the multiplexed signal received by said receiver using a corresponding predetermined spreading code to thereby extract a received version of the transmission signal;

a second demodulator that carries out despreading processing on the multiplexed signal received by said receiver using the spreading code assigned to the second known signal to thereby extract a received version of the second known signal;

a phase error detector that detects a residual phase error using the second known signal and the received version of the second known signal; and

a phase compensator that carries out phase compensation on said received version of each transmission signal using the residual phase error.

12. (New) A base station apparatus equipped with an OFDM-CDMA transmission apparatus and an OFDM-CDMA reception apparatus, said OFDM-CDMA transmission apparatus comprising:

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a first spreader that carries out spreading processing on a plurality of data signals using different spreading codes, respectively;

a second spreader that carries out spreading processing on at least one first known signal using a spreading code different from said spreading codes;

a frequency division multiplexer that breaks down the data signals spread at said first spreader and the first known signal spread at said second spreader into individual transmit chips and subjects said transmit chips to frequency division multiplexing by assigning one transmit chip data signal string per subcarrier such that information from each of the plurality of data signals

and the first known signal is multiplexed into every transmit chip assigned to a different subcarrier; and

a transmitter that transmits the data signals and the first known signal after being subjected to frequency division multiplexing at said frequency division multiplexer,

said OFDM-CDMA reception apparatus comprising:

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a receiver that receives a multiplexed signal comprising a plurality of subcarriers having a separate receive chip assigned to each subcarrier, each receive chip comprising information from a plurality of transmission signals and at least one second known signal that are subjected to spreading processing using different spreading codes, respectively, and subjected to frequency division multiplexing;

a first demodulator that carries out, for each transmission signal, despread processing on the multiplexed signal received by said receiver using a corresponding predetermined spreading code to thereby extract a received version of the transmission signal;

a second demodulator that carries out despread processing on the multiplexed signal received by said receiver using the spreading code assigned to the second known signal to thereby extract a received version of the second known signal;

a phase error detector that detects a residual phase error using the second known signal and the received version of the second known signal; and

a phase compensator that carries out phase compensation on said received version of each transmission signal using the residual phase error.

13. (New) A transmission method comprising:

a first spreading step comprising carrying out spreading processing on a plurality of transmission signals using different spreading codes, respectively;

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a second spreading step comprising carrying out spreading processing on at least one known signal using a spreading code different from said spreading codes;

a frequency division multiplex step comprising breaking down the transmission signals spread in said first spreading step and the known signal spread in said second spreading step into individual chips and subjecting said chips to frequency division multiplexing by assigning one chip data signal string per subcarrier; and

a transmission step comprising transmitting the transmission signals and the known signal after being subjected to frequency

division multiplexing in said frequency division multiplex step,  
wherein:

information from each of the plurality of transmission signals and the known signal is multiplexed into every chip assigned to a different subcarrier.

14. (New) A reception method comprising:

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a reception step comprising receiving a multiplexed signal comprising a plurality of subcarriers having a separate chip assigned to each subcarrier, each chip comprising information from a plurality of transmission signals and at least one known signal that are subjected to spreading processing using different spreading codes, respectively, and subjected to frequency division multiplexing;

a first demodulation step comprising carrying out, for each transmission signal, despread processing on the received multiplexed signal using a corresponding predetermined spreading code to thereby extract a received version of the transmission signal;

a second demodulation step comprising carrying out despread processing on the received multiplexed signal using the spreading code assigned to the known signal to thereby extract a received version of the known signal;



a phase error detection step comprising detecting a residual phase error using the known signal and the received version of the known signal; and

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*B'* a phase compensation step comprising carrying out phase compensation on said received version of each transmission signal using the residual phase error.

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